SMITHSONIAN
Zoogoer

For members of **FRIENDS OF THE NATIONAL ZOO**
MAY | JUNE | 2013

insect EXPRESS

Butterflies and bees operate nature's most important delivery service.

Great day.

Good day.

SMITHSONIAN
Zoogoer

CRISTINA SANTIESTEVAN

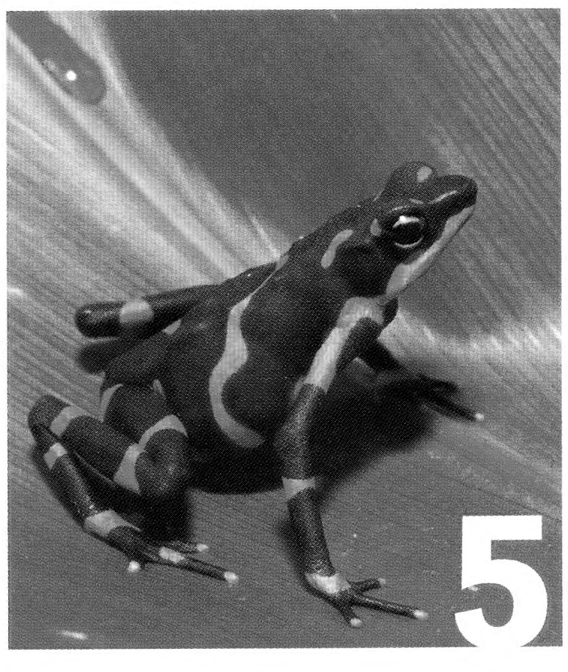
MAY | JUNE | 2013 | Vol 42, No 3

FEATURES

CONNOR MALLON/NZP

MAY | JUNE | 2013

DEPARTMENTS



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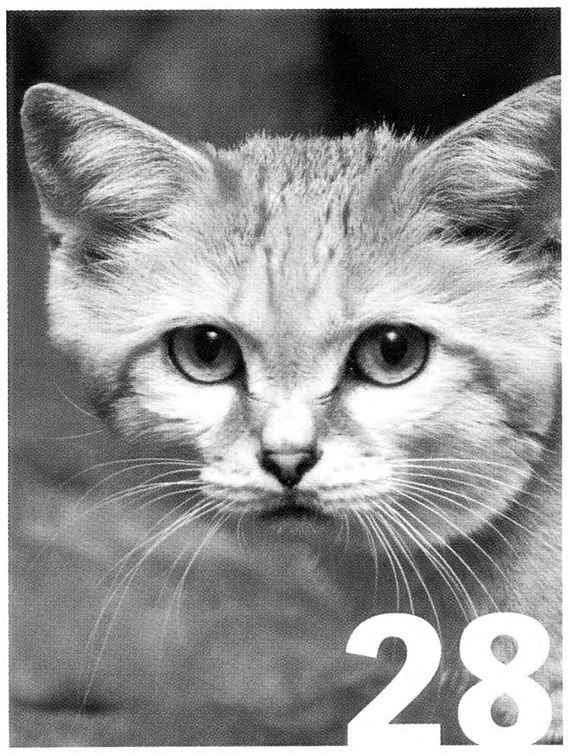

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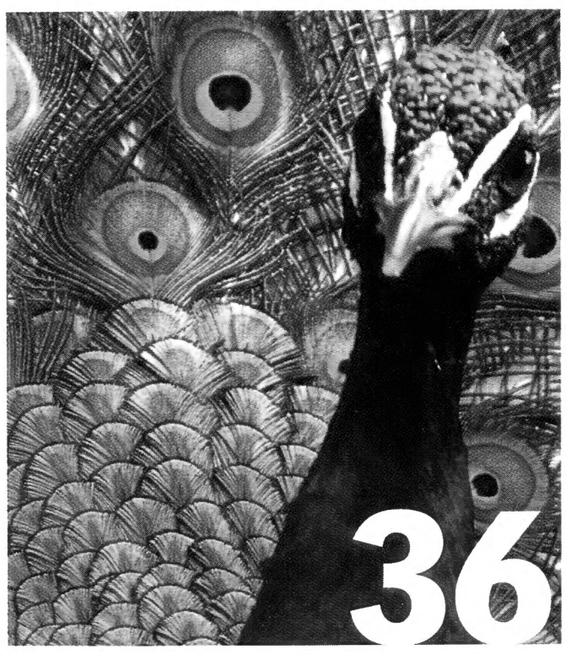

ANDREW KING

SMITHSONIAN Zoogoer

FONZ Friends of the National Zoo is the dedicated partner of the Smithsonian's National Zoological Park. FONZ provides exciting and enriching experiences to connect people with wildlife. Together with the Zoo, FONZ is building a society committed to restoring an endangered natural world. Formed in 1958, FONZ was one of the first conservation organizations in the nation's capital.

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Smithsonian **National Zoological Park** is located at 3001 Connecticut Ave., N.W., Washington, D.C., 20008-2537. Weather permitting, the Zoo is open every day except December 25. For hours and other information on visiting the Zoo, go to **nationalzoo.si.edu**.

Membership in FONZ supports the animal care, conservation, and educational work of the Smithsonian's National Zoo. It also offers many benefits: a *Smithsonian Zoogoer* subscription, discounts on shopping and events, discounted or free parking, and invitations to special programs and activities. To join, call 202.633.2922, or visit **fonz.org/join**.

Membership categories

Green	$55
Basic	$60
Premier	$80
Premier+	$110
Patron	$250
Sponsor	$500
Benefactor	$1,000
Director's Circle	$2,500
Conservation Circle	$5,000
Wildlife Society	$10,000
National (for those outside a 200-mile radius of Washington, D.C.)	$50

FONZ's membership structure changed on January 1, 2013.

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On the cover: Bees, butterflies, and other pollinators play a vital role in plant reproduction.
PHOTO BY CRISTINA SANTIESTEVAN

ASSOCIATION OF ZOOS & AQUARIUMS — The Smithsonian's National Zoo is accredited by the Association of Zoos and Aquariums.

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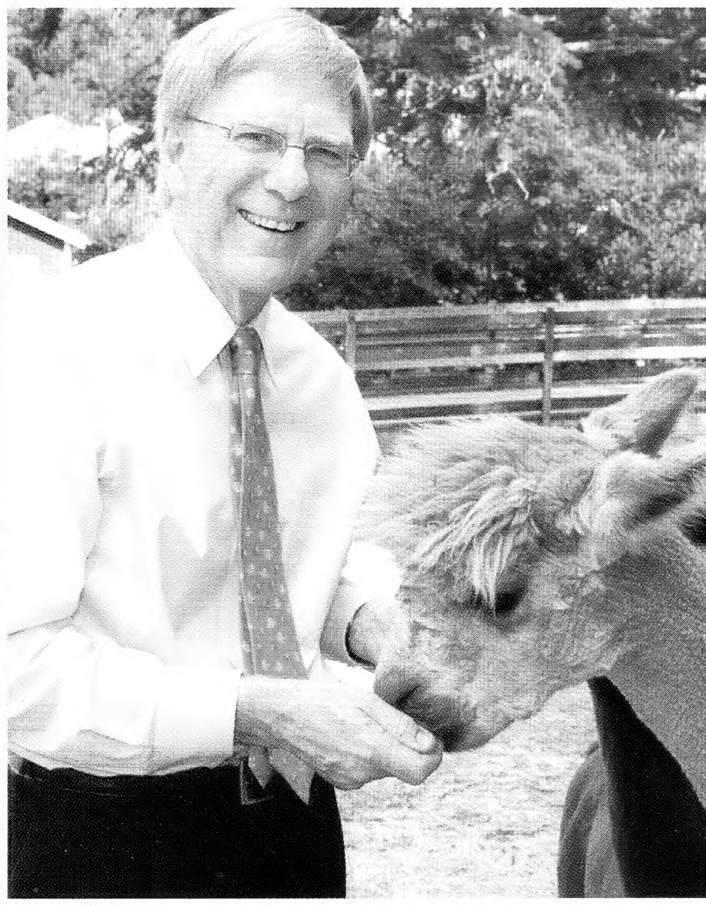
NOW MORE THAN EVER, THE ZOO IS A GREAT PLACE TO VISIT. With the completion of the amazing new Elephant Community Center and the arrival of Asian elephant Bozie from the Baton Rouge Zoo, we have a state-of-the-art facility to house and care for a growing elephant herd. This good news builds on the thrill of last fall's opening of the American Trail and our more recent news of the births of Andean and sloth bear cubs. With so much to see and enjoy, visitors are delighted to rediscover what a remarkable place the Smithsonian's National Zoo truly is.

But there is always more work to be done and improvements to be made. We take every opportunity to learn how we can provide better service to FONZ members and the millions of guests who visit the Zoo each year. We speak with visitors and event participants, and read your emails and letters to understand your expectations and identify ways we can improve.

Recently, you really surprised and thrilled us with your responses to a short survey. We were seeking to learn more about FONZ members, because understanding your priorities can help us tailor our offerings to best meet your needs. We included an open-ended question in which we asked you to tell us what the Zoo has meant to you.



MEHGAN MURPHY/NZP

Your response was overwhelming! Fourteen hundred FONZ members, more than half of all survey respondents, wrote descriptions of Zoo experiences that they cherished. These experiences filled a document that runs 167 pages, single-spaced. More impressive than the volume of comments, however, is what you said and your passion for animals and the Zoo. This simply was amazing and energizing.

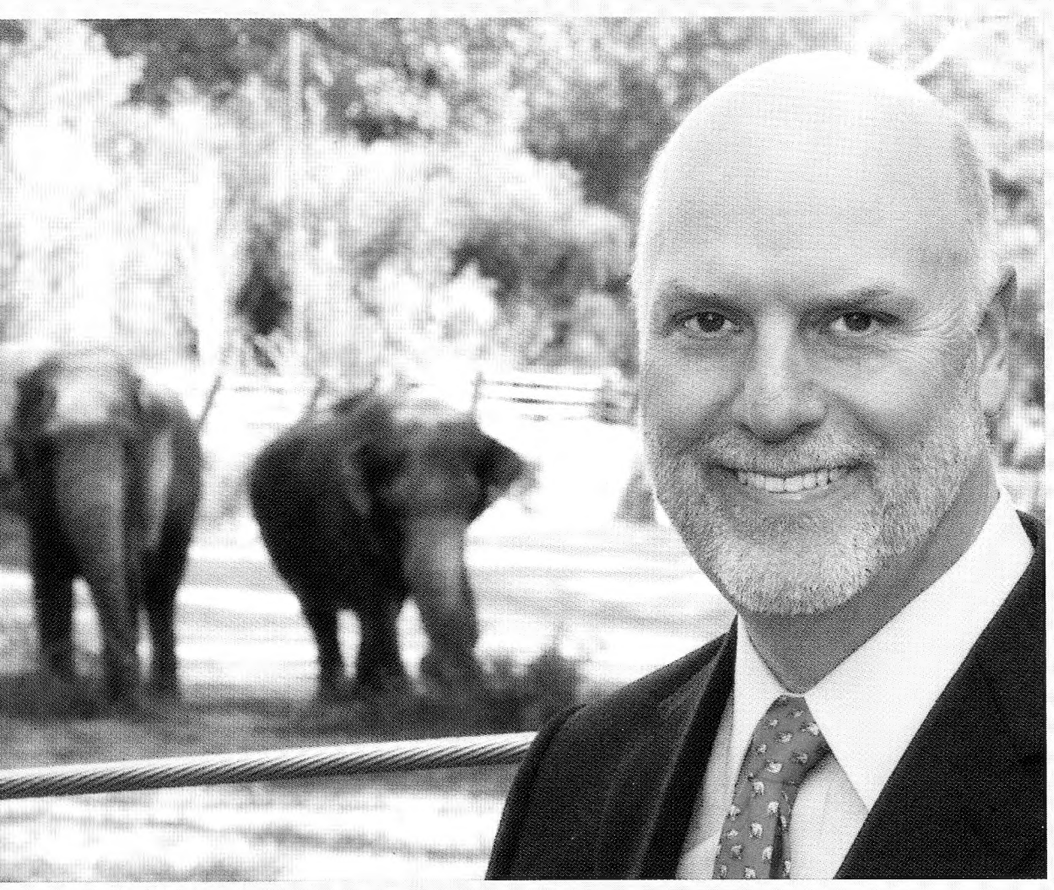
Many of you described the Zoo as fun, educational, awesome, interesting, wonderful, and supportive. This was humbling to read. Your individual stories can't be easily summarized, because each is unique and special. Overall, though, your comments reflected a shared understanding of, and commitment to, the Zoo's vital conservation mission.

Your descriptions of personal experiences at the Zoo and your support for the work being done at our Rock Creek and Front Royal campuses show that you cherish the impact the Zoo has had on your lives. Your responses inspire us to redouble our efforts to serve you and to ensure that species can survive and thrive on this planet. Thank you.

Sincerely,

Bob Lamb

Bob Lamb
Executive Director, Friends of the National Zoo



MEHGAN MURPHY/NZP

OVER THE PAST FEW YEARS, YOU HAVE SEEN NUMEROUS CONSTRUCTION ZONES AROUND THE ZOO as crews worked to finish the American Trail, the Speedwell Foundation Conservation Carousel, and the seven-year endeavor of Elephant Trails. This spring, with the completion of those undertakings, we are thrilled to announce the first year of full accessibility to every exhibit at our Zoo.

Each of these monumental projects was a great milestone in the Zoo's quest for continual improvement. But, as you might have guessed, the construction is not yet over. Our new exhibits are attracting more visitors, which is exactly what we want and need. More visitors, though, mean a busier park. Now we turn our attention toward another problem we face, a shortage of parking.

Our urban location makes it impossible for the Zoo to add additional parking without using land necessary for animals. Our solution: build up, not out. The Zoo's master plan calls for building a six-level garage above what is currently Lot C. Our vision will improve the visitor experience, and create a convenient new entrance that leads guests right into the heart of the Zoo. The new garage will then free us to convert Lots A, B, and D into larger animal exhibits.

My colleagues and I see great potential in what this plan will do for the National Zoo; however, it will not be an easy feat. Realizing our vision will require a great deal of time, energy, and cooperation from volunteers, staff, and you, our members. The structure underpinning the General Services Building on Lot C is aging. This is why our first task is to reinforce the service building, which is necessary for erecting the long-planned garage safely. Work during the project will require narrowing North Road to a single lane of traffic and closing Lot C to visitors. These changes will begin in July.

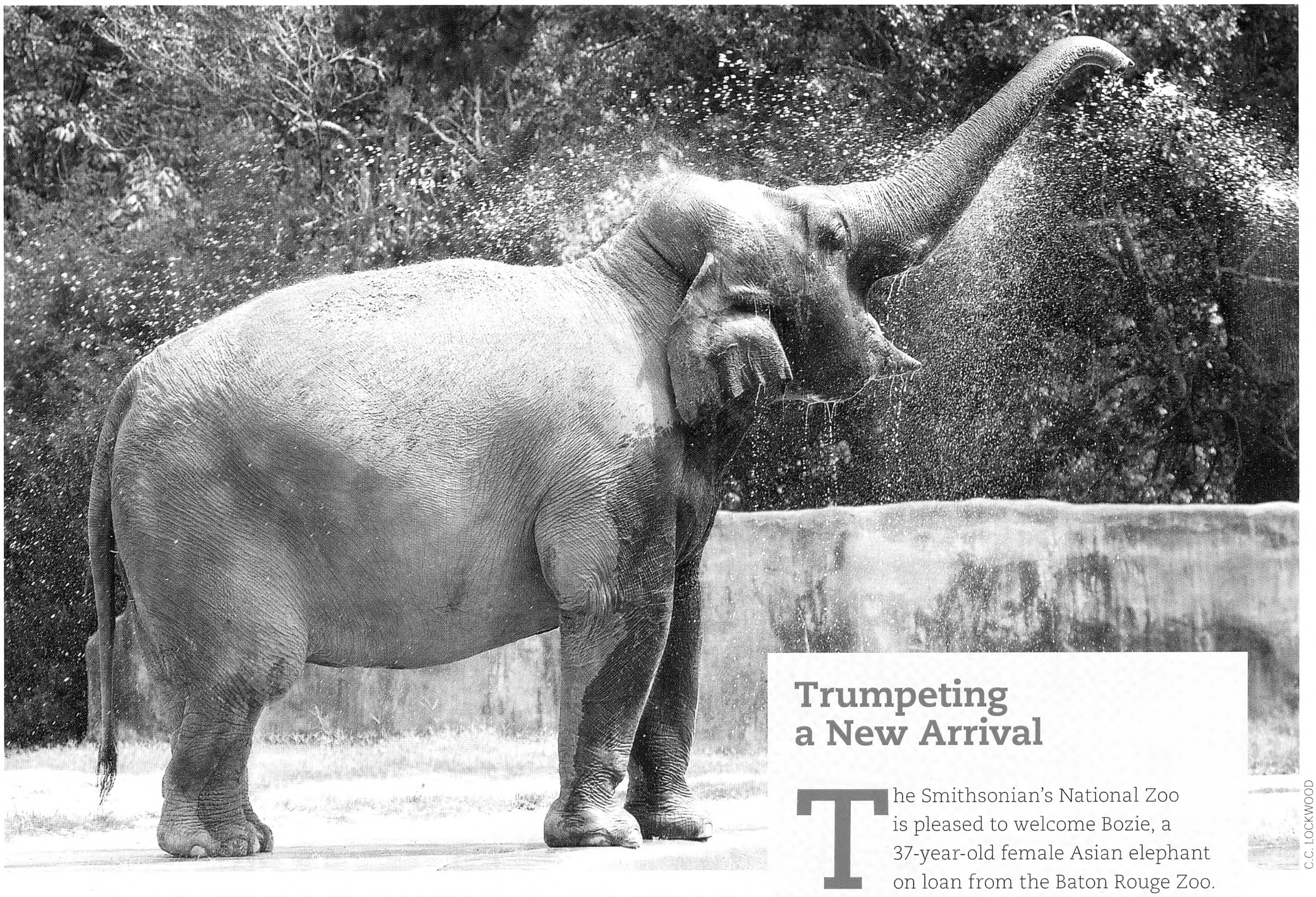
On behalf of the entire Zoo community, I wholeheartedly apologize for any inconvenience or delays on North Road. My colleagues and I will do our very best to manage traffic congestion and circulation. My hope is that you will recognize the great benefits of this project for all visitors in the long run.

Other projects are under way as well. Safety improvements are being made around the Zoo, especially in the lower area to improve traffic flow and pedestrian safety. Construction has already begun to install a perimeter fence, which will enclose the Zoo to meet requirements for accreditation by the Association of Zoos and Aquariums.

We worked exceptionally hard to be ready for the AZA accreditation inspection this spring. I thank and credit each staff member for his or her hard work. Special kudos go to Dr. Don Moore, the associate director for animal care sciences, who led the charge. We're proud of who we are, and we look forward to a bright future—with you at our side. I hope to see you at the Zoo this summer!

Sincerely,

Dennis Kelly
Director, Smithsonian's National Zoological Park



C.C. LOCKWOOD

Trumpeting a New Arrival

The Smithsonian's National Zoo is pleased to welcome Bozie, a 37-year-old female Asian elephant on loan from the Baton Rouge Zoo. Bozie's last companion at the Baton Rouge Zoo died in March. At the National Zoo, she will join Ambika, Shanthi, and Kandula in the newly opened Elephant Community Center and Elephant Trails exhibit, which can house a herd of 10 to 12 elephants.

Bozie will spend a minimum of 30 days in quarantine, per standard procedure. An expert team of elephant keepers, nutritionists, and veterinarians will care for her. Following quarantine, Zoo staff will begin the process of introducing her to females Ambika and Shanthi and male Kandula. Bozie was born in the wild around June 1975 and came to the United States from an elephant orphanage in Sri Lanka on November 2, 1976.

Funds for the elephant transfer were provided by Friends of the National Zoo.

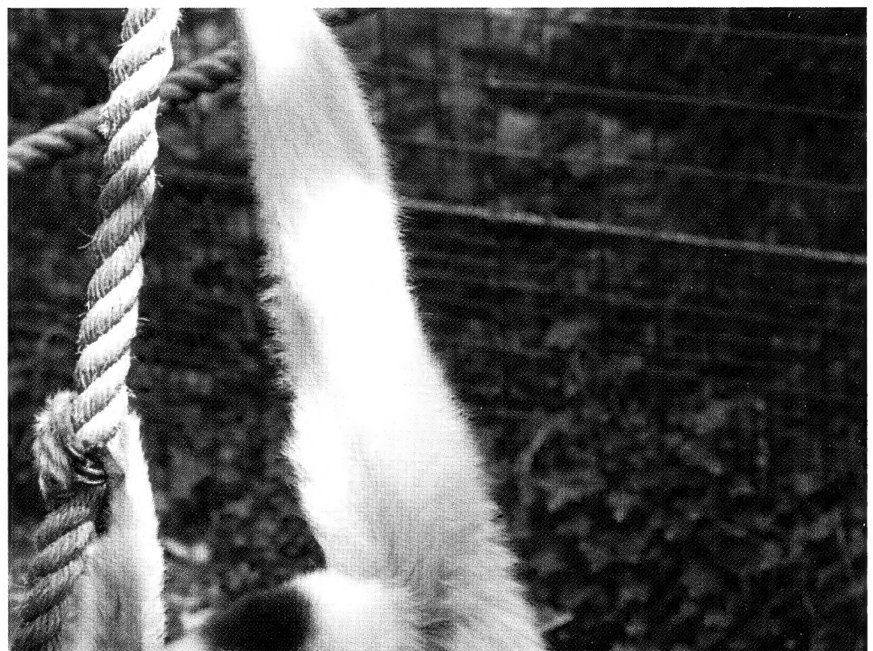
DANIEL REIDEL

Lions to Depart The Smithsonian's National Zoo bade farewell to the last of the seven lion cubs born here in 2010. John departed May 14 for his new home at the Cincinnati Zoo. Females Lelie and Lusaka departed May 22 for their new home at the Buffalo Zoo.

New Arrival in Small Mammal House

A seven-year-old sand cat named Thor is the newest addition to the Zoo's Small Mammal House. Native to Northern Africa, Southern Asia, and the Arabian Peninsula, sand cats are the only cats that live in true desert ecosystems. They are well-adapted to survive in the desert: Their foot pads have fur; they get most of the water they need by consuming prey (small birds, rodents, and some reptiles); and they are able to withstand very hot and cold temperatures by burrowing in the sand. Degradation of their desert habitats is the largest threat to the species, which is listed as near threatened.

CONNOR MALLON/NZP



MEHGAN MURPHY/NZP

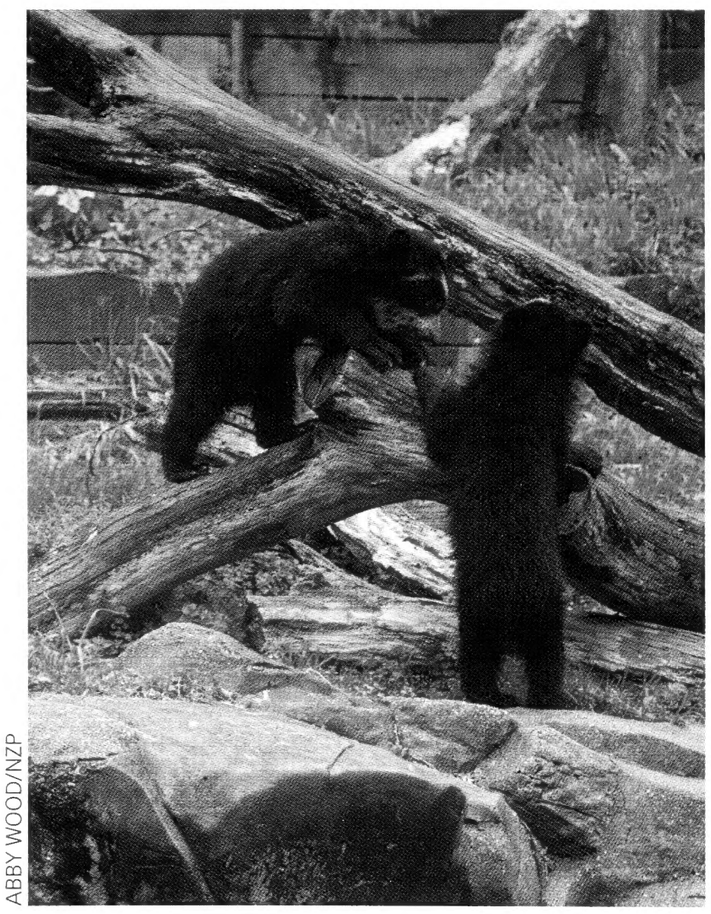
National Zoo Mourns Loss of Elderly Gibbon

Mae, an elderly white-cheeked gibbon, died April 8 at the National Zoo. She was 43 years old and had lived well past the typical 28-year life expectancy of zoo gibbons. Mae arrived at the Zoo in 1976 from the Los Angeles Zoo. Because she was wild-born, her genes were very valuable to the gibbon population in human care. She contributed ten offspring to her species' survival—seven males and three females.

White-cheeked gibbons are considered endangered. Visitors can see two white-cheeked gibbons and two siamangs on exhibit at Gibbon Ridge.

Adventurous Andean Bear Cubs

Curt and Nicole, the National Zoo's two Andean bear cubs, made their debut appearance in their exhibit on Saturday, May 11. The cubs were born at the Zoo on December 14, 2012. They are the second litter of cubs born at the Zoo since 2010, and one of only three litters born in North American zoos in the past six years. Curt, Nicole, and their mother, Billie Jean, can be seen on exhibit daily, weather permitting. The cubs will remain with Billie Jean for approximately one year.



ABBY WOOD/NZP

SCBI Scientists and Collaborators Breed Rare Frog for First Time

BRIAN GRATWICKE/SCBI

The limosa harlequin frog (*Atelopus limosus*), an endangered species native to Panama, now has a new lease on life. The Panama Amphibian Rescue and Conservation Project is successfully breeding the chevron-patterned form of the species in human care for the first time. The rescue project is raising nine healthy frogs from one mating pair and hundreds of tadpoles from another pair.

"These frogs represent the last hope for their species," said Brian Gratwicke, international coordinator for the project and a research biologist at the Smithsonian Conservation Biology Institute, one of six project partners. "This new generation is hugely inspiring to us as we work to conserve and care for this species and others."

The mission of the Panama Amphibian Rescue and Conservation Project is to save amphibian species that are in extreme danger of extinction throughout Panama. Current project partners include Cheyenne Mountain Zoo, Houston Zoo, the Smithsonian's National Zoo, the Smithsonian Tropical Research Institute, and Zoo New England.

CONNOR MALLON/NZP

Waiting for a Cub?

After detecting a rise in urinary estrogens in Mei Xiang, a team of Zoo scientists and veterinarians, including Tang Chunxiang, the assistant director and chief veterinarian of the China Conservation and Research Center for the Giant Panda at Wolong, performed two artificial inseminations on March 30. Mei Xiang was inseminated with a combination of fresh and frozen semen from the National Zoo's male giant panda, Tian Tian, as well as frozen semen from the San Diego Zoo's male giant panda, Gao Gao. National Zoo scientists will run a paternity analysis if a cub is born.

The Zoo's plans for breeding Mei Xiang and Tian Tian were developed in accordance with the Giant Panda Cooperative Research and Breeding Agreement. Tang traveled to the Zoo to assist with breeding as part of the agreement. The Zoo received approval for its breeding plans from the China Wildlife and Conservation Association and the U.S. Fish and Wildlife Service, which monitors giant panda research programs in the United States.

Zoo scientists will monitor Mei Xiang's hormone levels in the coming months and conduct ultrasounds to determine if she is pregnant. A pregnancy lasts between 95 and 160 days. Female giant pandas experience delayed implantation, during which the embryo does not implant in the uterine wall until a few weeks before birth and a fetus does not start to develop until the final weeks of gestation. It is impossible to determine from behaviors and hormone analyses alone if a female is pregnant or experiencing a false pregnancy.

CONNOR MALLON/NZP

CHASKA DEPARTS

The Smithsonian's National Zoo bade a fond farewell to Chaska, a female Andean bear who departed on May 1 for her new home at the Salisbury Zoo. Chaska and her brother, Bernardo, were born at the National Zoo in January 2010. Bernardo left for the Tulsa Zoo in April 2012. Their mother, Billie Jean, remains at the National Zoo with their younger siblings, Curt and Nicole.

CHRIS CROWE/NZP

White-Naped Crane Chick Hatches at Front Royal

The Smithsonian Conservation Biology Institute in Front Royal celebrated the hatching of a white-naped crane chick this spring. Because the chick's biological mother, Amanda, was hand-raised and socially bonded with humans, the egg was transferred to the care of experienced crane parents Brenda and Eddie. The chick hatched on April 14, and Brenda and Eddie have proven to be exceptional surrogate parents.

Cheetah Cubs Celebrate First Birthday

Cheetahs Justin and Carmelita celebrated their first birthday with gifts of bones and toys on April 23. The two will remain together at the National Zoo for at least another six months.

JEN ZOON/NZP

CONNOR MALLON/NZP

Splashdown on American Trail

On May 16, three gray seals (Gunther, Kara, and Kjya) and two harbor seals (Luke and Squeegee) entered the water together for the first time and explored their new digs in the American Trail seal pool. Selkie, the Zoo's elderly gray seal, will soon join them. Visitors can view the seals up close and watch training and feeding demonstrations at 11:15 a.m. every day.

Mark Your Calendar

July 11 **Brew at the Zoo**
Raise your glass to conservation and sample beer from more than 40 microbreweries at our annual Brew at the Zoo. **Learn more at fonz.org/brew.**

July 13 **Reptile and Amphibian Conservation Day**
Meet scientists at the Reptile Discovery Center to learn about conservation issues facing reptiles and amphibians in the wild and what the National Zoo and other organizations are doing to help them.

July 28 **Global Tiger Day**
Celebrate the top predator in Asia with great cat keepers, Smithsonian Conservation Biology Institute researchers, SCBI's partners in tiger conservation, and the Zoo's Sumatran tigers. **10 a.m. to 2 p.m. at the Great Cats exhibit.**

PARKING LOT CONSTRUCTION BEGINS — Beginning in July 2013, North Road will be reduced to one lane for the duration of a construction project that will improve the General Services Building at Parking Lot C. Following the completion of this project, the Smithsonian's National Zoo will start work on building a six-level parking garage above what is currently Lot C. The garage will alleviate a parking shortage, and will ultimately allow the Zoo to convert Lots A, B, and D into larger animal exhibits.

SALAMANDER AMBASSADORS

A group of Friends of the National Zoo volunteers who have dubbed themselves the Salamander Ambassadors are working to help the Zoo build a new home for salamanders from Appalachia. Come visit the Salamander Ambassadors at the Reptile Discovery Center most weekends in the late spring, summer, and early fall. Volunteers will answer questions about salamanders, share amphibian artifacts, and explain how you might help join in the effort to protect Appalachia's salamander populations.

Learn more at **fonz.org/salamanders.**

MARK VAN BERGH

Elephants are larger. Tigers have more dramatic stripes.
Most birds fly farther and longer.
But no animals handle a more important task than bees,
butterflies, and their pollinating peers.

TINY WORKERS, giant job

BY CRISTINA SANTIESTEVAN

CRISTINA SANTIESTEVAN

The Pollinarium at the Smithsonian's National Zoo is filled with screams. "Butterflies!" shrieks a schoolchild. "There's one," shouts another. "I see it!" answers a third. Just about every child who bursts through the door from the darkened interior of the Invertebrate Exhibit into the sunlit Pollinarium reacts in a similar fashion. Kids shout and laugh, delightedly pointing out the orange Julia and zebra longwing butterflies that flutter past their faces. "It's a butterfly exhibit!" they cheer.

It's easy to miss the Pollinarium. Not large, it lies behind the Reptile Discovery Center and the Invertebrate Exhibit. Countless zoogoers overlook this hidden treasure. That's a shame, because the Pollinarium offers a rare chance to visit with free-flying butterflies and flowering plants just about any day of the year.

CRISTINA SANTIESTEVAN

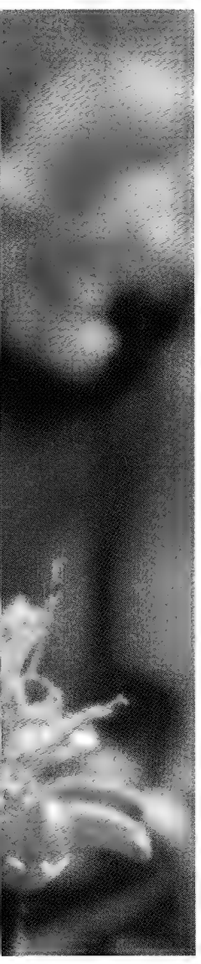
Many pollinators find butterfly weed—
a native North American plant—irresistible.

TINY WORKERS, giant job

CRISTINA SANTIESTEVAN

JESSIE COHEN/NZP

CRISTINA SANTIESTEVAN



MEHGAN MURPHY/NZP

CLOCKWISE FROM TOP LEFT: **Skipper butterfly caterpillar in the author's garden; great spangled fritillary; zebra longwing butterflies at the Zoo's Pollinarium; a skipper butterfly; a pearl crescent butterfly rests on an aster flower.**

CRISTINA SANTIESTEVAN

"Butterflies and other invertebrates aren't the first thing people think of at the Zoo," says Alan Peters, curator of invertebrates. "They tend to be forgotten. But they're something like 99 percent of all the animals in the world. They're beautiful and amazing and interesting."

Butterflies, bees, and their pollinating comrades represent some of the most important yet overlooked species around us. This motley collection of insects—along with some mammals, birds, and reptiles—has a strong taste for nectar or pollen. They travel from one flower to another on a quest for their food of choice. In the process, pollinators also transfer grains of pollen from one flower to another. This is how many flowering plants breed. While some plants use wind to disperse their pollen, approximately three-quarters of the world's flowering plants rely on pollinators to fertilize their flowers. Without bees and their brethren, these plants would produce no fruits, no nuts, no vegetables.

"Pollinators are not an option," says Peters. "We just can't do without them."

Pollinating Superstars

Honeybees are probably the best-known pollinators. They do great service pollinating wide swaths of fields and orchards, and they (reluctantly) share the sweet fruit of their labors with humankind.

But honeybees are not native to the U.S., and it's unlikely they are our most important pollinator. Agricultural crops are generally pollinated by many bee species, including honeybees and native bumblebees, miner bees, and mason bees. "Most pollinators on the East Coast—for pumpkins, blueberries, even our orchards—are native species, not honeybees," says Donna Stockton, keeper at the Pollinarium and resident native bee expert.

The list of native pollinators is vast and much more varied than most people realize. "Bees are superstars," says Stockton. "And things like flies, mice, ants, wasps, and beetles also do a super pollinating service. Butterflies are more visible. But bees are far more efficient as pollinators."

This doesn't mean butterflies serve no purpose. Butterflies and hummingbirds use their long nectar-seeking tongues

TINY WORKERS, **giant job**

MEHGAN MURPHY/NZP

to reach into flowers too deep for many other pollinators. Native trumpet creeper, for example, is pollinated primarily by hummingbirds that accidentally collect and transport pollen from the deep-throated flowers on their heads and beaks.

Abuzz at the Zoo

Pollinarium visitors may soon be able to glimpse hummingbirds and native bees in and around the exhibit, where a planned update is already in the works. "Pollination has become a hot topic," says Peters. "We want to shift our focus and talk about pollinators specifically: what they are, what they do, and why they're important."

The improvements, which will include new graphics as well as new animals, may be implemented as early as this summer. The updates will embrace both the interior of the Pollinarium, where hummingbirds may soon build nests and raise chicks, and the exterior, where visitors may be able to get up close to a native bumblebee hive.

Looking at the hive may be quite an education, for a bumblebee hive looks nothing like a honeybee hive. Bumblebees build their nests underground or beneath tufts of grass. Their colonies tend to be small, often numbering fewer than 50 individuals. "Artificial bumblebee hives look like little boxes that sit on the ground with a tube coming out," says Stockton, who explains that bumblebees are not aggressive or prone to sting.

Almost as prevalent as fear of bees, Stockton points out, is fear of flowers. "So many people are afraid of pollen now, because of allergies. But it's really tree pollen that causes allergies."

Depending upon the plant, pollen may be either wind-dispersed or animal-dispersed. Many trees and grasses produce small, lightweight grains of pollen that can be carried far by wind, dusting our cars and triggering allergic reactions in the process. Most garden flowers, in contrast, are pollinated by animals.

"You can look at the structure of the pollen and see the difference," explains Stockton. "If you look at most of the tree pollen, it's smaller, it's got less water in it, and it's rounder. But if you look at the heavier pollen that flowers produce, you see the most amazing, crazy shapes. It's spiked, it's long, it's frilly. The pollen is meant to stay on the animal that came to visit."

That heavier pollen needs animals to transport it. That reliance fuels fears about a recent—and potentially devastating—development: pollinator decline.

Welcoming Pollinators

Pollinators—honeybees and their wild colleagues—appear to be declining around the world. Despite their importance, we know very little about the abundance, health, and distribution of the world's native pollinators. As frightening reports of mysteriously disappeared honeybee hives are becoming more common, concern is growing that native pollinators may also be at risk.

In a 2007 report named *Status of Pollinators in North America,* the National Academy of Sciences called attention to a "demonstrably downward" trend in the populations of many wild pollinator species. Already more than 20 species of butterflies are listed as endangered or threatened in the United States, and approximately 40 more are considered species of concern or potential candidates for listing as an endangered or threatened species. It does appear that our pollinators are declining. But which species, how rapidly, and why?

It is essential that we learn more. "We say decline, but a lot of people don't even

Bee Part of Smithsonian Science

FONZ members and others in and around Washington will soon have the opportunity to help out with a native bee research project. In an effort to better understand the distribution and diversity of local bee populations, scientists at the Zoo are organizing a multi-year citizen science project to conduct bee censuses throughout the region. The results will increase our understanding of local bee populations, and may help guide future decisions about development and conservation.

The project is open to all interested individuals; no prior experience is required. All participants will be asked to complete a training program, which will include one or more field trips and classroom discussions. Training will begin this summer, and population surveys are expected to start in spring 2014.

Want to help or learn more? Please contact Donna Stockton at stocktond@si.edu.

CRISTINA SANTIESTEVAN

TRY THIS AT HOME

Interested in welcoming pollinators into your yard and life? The Virginia Native Plant Society (vnps.org) and Maryland Native Plant Society (mdflora.org) provide plenty of information on how to get started.

One way to lure mason bees is to build them a house. It's easy. All you need is a drill, some scrap wood, and about 15 minutes of spare time. Visit outlawgarden.com/masonbee for an easy-to-follow tutorial.

know what was there to begin with," says Stockton. Baseline population numbers don't exist for most native pollinator species. The only way to track a population decline is to compare census numbers from years of observation. Such data simply don't exist for native bees and other pollinators. "As far as honeybees, we know there is a problem," says Stockton, who explains that pesticides, viruses, mites, and other things may be contributing to the current decline in honeybee populations. "But native bees? That's a big question. We're not really sure."

Stockton suspects that pollinator decline may be linked at least somewhat to modern, sterile lawns, which means the solution is partially in our hands. "In your individual garden, if you're using a bunch of pesticides, and you're only planting grass and no flowers that would attract these pollinators, sure, you won't see pollinators because you've created a system in your garden that's not very sustainable. It's not very good. But if you're planting flowers, if you have trees that are blooming, if you leave some leaf debris out over winter, you will have these animals in your yard."

Gardeners who hope to attract native bees, butterflies, and other pollinators will need to welcome a bit of mess into their yard, says Stockton. "You can have a lawn. But also have an area where it's not just a pretty bunch of petunias. Have an area where there are ten different types of flowers. Pollinators are so different. You need to have a variety of things that are going to offer nectar and pollen." The most pollinator-friendly gardens feature a range of flowers that bloom throughout spring, summer, and fall.

A variety of colors is just as important as a range of bloom times. "Believe it or not, all these animals see differently," explains Stockton. "Hummingbirds are attracted to red flowers, butterflies are going to be attracted to something else, and some pollinators can't see certain colors."

In addition to flowers and leaf debris, pollinator-friendly gardens often include a water source, native plants, and no chemicals. Many popular herbicides and pesticides are detrimental to pollinators and other beneficial insects. If possible, avoid hybrid plant varieties that sometimes don't produce pollen or nectar, or ask a native plant society for a list of pollinator-friendly plants. Consider adding a bee house, an easy-to-build project that will attract native mason bees by providing them with a place to build their solitary nests.

"Every pollinator deserves a home," says Peters, who lists native bees among his favorite pollinator species. Stockton agrees and hopes that more people will welcome bees and other pollinators into their yards and gardens as they learn more about these abundant—and essential—native species. "Bees aren't so scary," says Stockton. "They're really cool." SZ

— Freelance writer-photographer CRISTINA SANTIESTEVAN *is a contributing editor to* Smithsonian Zoogoer.

MEGAN MURPHY/N. P.

DIED

BY BRITTANY STEFF

Ask a child to draw a bird, and many will sketch the same thing: a double-arched line winging through a wild sky.

These childish sketches boil the idea of a bird down to its essence—flight. Birds do many things: They sing, eat, bathe in puddles, build nests, and lay eggs. But mostly, birds fly.

Except that not all of them do. Of the tens of thousands of bird species on this planet, a few are left behind on the ground. Ostriches, for example, race across the African savanna. Kiwis in New Zealand nestle into burrows and prod the ground for worms. Penguins in Antarctica do fly, after a fashion, but through water rather than air.

The secret behind these birds' abandonment of the skies reveals a lot about what it means to be a bird—flighted or not.

GROUNDED

JESSIE COHEN/NZP

Winging It

Scientists aren't sure what caused birds to take to the skies, and the fossil record is murky. Experts do know that at some point, millions of years ago, a branch of dinosaurs began experimenting with flight. That branch of the family tree then survived the mass extinction that felled the rest of the dinosaurs, and went on to become the animals we call birds.

But, having once acquired flight, what would cause a bird species to become flightless? The primary reason is simple; birds fly only when there's something to fly away from, such as a predator, or toward, like food sources or safe nesting sites.

Steve Sarro, a curator at the Smithsonian's National Zoo and the Species Survival Plan coordinator for African penguins and spectacled owls, explains that flight is just like any other adaptation; animals tend to use it or lose it. "Flightlessness evolves whenever flight is no longer needed," says Sarro. "It's very much the same as cave-dwelling animals. Naked mole-rats are a perfect example. If you're underground your whole life, and there's nothing to see and no light, then why have good vision?" Similarly, if there are no predators and nothing to fear on the ground, why bother flying?

New Zealand is a classic example. For millions of years, after the breakup of Gondwanaland but before the arrival of humans, New Zealand had no mammals except for a few species of bats and marine mammals. Consequently, many New Zealand bird species veered off evolution's flight path, including kiwis, a number of rails and teals, and the kakapo, the world's only flightless parrot.

Then, of course, there are penguins. These black-and-white birds are beloved for their striking plumage, their parental devotion, but most of all, for their endearingly awkward gait on land. Penguins can't fly, and most of them can't even walk gracefully.

In fact, Sarro says penguins and puffins, their Northern Hemisphere counterparts, are an excellent natural illustration of the benefits and drawbacks of flight. Puffins and penguins are both black-and-white birds that eat fish from the sea. But puffins can fly and penguins cannot. That, Sarro explains, is because puffins have land-based predators and penguins do not. "Puffins need to fly to escape predators. They need to be able to nest up on cliffs, where predators can't go. Penguins don't need to worry about escaping land-based predators, so they don't need to fly."

Of course, predators are not the only reason birds fly. Some birds use flight to travel long distances or to exploit a niche or food source that's underutilized. Often, flight pays off. This is why only a few bird species have found it evolutionarily prudent to stay on the ground.

Rising Cost of Air Travel

The main reason that birds give up the sky is simple budgetary common sense. Flying, whether as a bird or as a passenger on a 747, is expensive. While birds don't generally require expensive airline tickets, their form of flight is costly on an evolutionary, energetic, and caloric level.

Most birds' bodies are engineered for the demands of flight. Their skeletons are built to anchor strong wing muscles, their bones are light and hollow, their feathers are aerodynamic, and their wings are ideal for getting them off the ground and into the sky.

Beyond structural considerations, flying takes a lot of energy. Contrary to what

DID YOU KNOW?

Among emus, ostriches, kiwis, and other ratites, it tends to be the father who incubates the eggs and cares for the chicks.

PREVIOUS PAGE: **Greater rhea chicks seek shelter among their father's feathers.**
LEFT: **More than six feet tall, emus are the largest birds in Australia. Only Africa's ostriches stand taller.**
RIGHT: **Male greater rheas provide all the parental care for their chicks. Once the female lays her eggs, she leaves them in the father's custody.**
BELOW: **New Zealand is home to all five species of kiwi, including the brown kiwi shown here. Unlike most birds, kiwis have a powerful sense of smell, which they use to find worms, grubs, and other food items.**

MEHGAN MURPHY/NZP

MEHGAN MURPHY/NZP

the saying "eats like a bird" implies, birds must ingest huge amounts of calories to fuel flight.

"Birds that fly spend a lot more energy than birds that don't," explains Kathy Brader, a bird keeper at the National Zoo's Bird House. "It's like cars and planes. Your car burns gas and drives on the ground, but a plane going up in the air uses a lot more gas. A bird on the ground uses energy, but not nearly as much as a bird that has to get up off the ground."

Often, birds that do fly will find ways to economize, says Warren Lynch, bird unit manager at the Zoo's Smithsonian Conservation Biology Institute. "Big, soaring birds are incredibly energy efficient. Once they get up in the air, some don't even really need to flap their wings," says Lynch. "Albatross, for example, can stay on the wing for hundreds of miles without even flapping. They just use available wind currents coming off the ocean. They can cover thousands of miles before coming back to land."

GROUNDED

A bird on the ground uses energy, but not nearly as much as a bird that has to get up off the ground.

Brader agrees. "That's why migratory birds and birds of prey fly in patterns. They have to take advantage of currents as much as they can. Otherwise, they'd never get anywhere. Sustained flight takes up huge amounts of energy."

Given the costliness of flight, only birds that really need to fly are likely to bother with it.

Weight Restrictions

As any veteran traveler knows, the secret to successful airline travel is to pack light. The same is true of birds; birds that are too heavy simply cannot fly.

"There's a size limit to flying birds," Brader explains. "That is a good thing because otherwise ostriches would fly, and that's a scary thought."

The weight limit for birds seems to be right around 40 pounds, according to Sara Hallager, a biologist at the Zoo's Bird House. "Kori bustards are the heaviest flying birds, and they're right at the limit for flight. Males weigh 40 pounds. Once you get beyond that, the pure weight of the bird limits flight. Most ratites are simply too big."

Ratites are a group of flightless birds that includes ostriches from Africa, emus and cassowaries from Australia and New Guinea, rheas from South America, and, oddly enough, kiwis. They all lack a keel bone, which flying birds use to anchor powerful wing muscles. Their bones are denser than the bones of flighted birds, and they tend to have smaller, stubbier wings.

With the notable exception of the kiwis, ratites have traded the ability to fly for larger body size. Kiwis and cassowaries didn't have many predators when they abandoned flight, and the other ratites have used their strength and size to their advantage.

Because they don't have to worry about weight limits, ostriches and other ratites can grow larger than 40 pounds—*much* larger. The largest ostriches can weigh up to 320 pounds, and the rest of the ratites tend to weigh in at around 100 to 150 pounds.

Flightlessness does not mean helplessness. Ostriches, for example, can reach running speeds of up to 43 miles an hour, and their legs are so powerful that one well-aimed ostrich kick can kill a lion. "When you can't fly, your main defense is running," says Hallager. "Wings act like rudders; ratites can use them to help steer. Kiwis and cassowaries have very little wings because they don't really need to move very fast, since they don't have many native predators."

Ostriches and rheas aren't the only flightless birds to still find a use for their wings. Some flightless birds use their wings in mating and courtship displays, and penguins use their wings to maneuver their torpedo-shaped bodies through the water.

Fight for the Flightless

Unfortunately, when one counts the ranks of flightless birds today, a number of them are missing. They've gone extinct.

Once birds lose their ability to fly, they can't regain it quickly. This can have unfortunate consequences when predators such as humans, rats, stoats, snakes, or cats invade an area that was previously predator-free.

This extinction process is illustrated in miniature by the story of the Stephens Island wren. This flightless, or nearly flightless, songbird was discovered and went extinct almost immediately. It lived only on a single small island off the coast of New Zealand, where it is rumored that the lighthouse keeper's cat extirpated the entire species. Scientists debate the details of this story, such as whether a single cat ate *all* the birds, and whether that cat was or was not named Tibbles. But, details aside, the story stands: Introducing a predator where there was none before spells disaster for flightless birds.

MEHGAN MURPHY/NZP

This process has been repeated on islands and continents the world over. The dodo fell to hungry sailors on Mauritius. The same fate awaited the great auk on Atlantic islands. Invasive snakes devastated the Guam rail population. Humans even extinguished terrifying giants such as Madagascar's ten-foot tall, 880-pound elephant bird and New Zealand's twelve-foot tall, 550-pound moa, two species of birds that once grew larger than either of the tigers at the National Zoo. But size is no defense against humans. Not only could the flightless birds not escape their hunters' weapons, they also could not fly to find safer places to live.

Today, the Smithsonian's National Zoo works to conserve flightless birds. Kathy

Although double-wattled cassowaries are not endangered, they are threatened by overhunting and the destruction of their rainforest habitat in Australia and New Guinea.

Brader manages the lives and breeding of all kiwis outside of New Zealand. Keeper Kristen Clark coordinates the management and breeding for greater rheas in Association of Zoos and Aquariums (AZA) institutions. And Sara Hallager is the chair of the group that oversees all ratites in AZA institutions.

In addition to helping manage and breed zoo populations of ratites, the National Zoo is helping save flightless species. The Zoo is part of reintroduction programs for the Guam rail and North African ostrich.

"Ratites in general just aren't doing well," says Hallager. "Except for the emu, every single living ratite is facing major conservation issues today. And even some populations of emus are endangered, though the overall species is not." They're beleaguered by habitat loss, hunting, and invasive species—especially predators.

The problem is also one of perception, explains Hallager. "People think, 'Ostrich? There's millions of ostrich around!'" And it's true—there are many ostriches on farms and in zoos. However, many of these animals are muddled hybrids that aren't valuable for conservation, breeding, or reintroduction.

"Ratites are disappearing in the wild, and most people, even people who work in zoos, aren't aware of this. There are lots of species declining in the wild, but the big birds—there are only four of them—they're all in trouble." It's not just the big birds. The small flightless birds—the kiwi, the kakapo, the penguin, the rail—are fascinating evolutionary marvels, scrappy survivors of bygone eras facing new challenges from humans and introduced predators.

Flightless birds are living testaments to the infinite diversity and creativity of evolution and adaptation. They are weird, wonderful reminders that default strategies don't have to be the only ones. Without them, something precious would waddle, run, and amble its way out of our world.

—BRITTANY STEFF *is a freelance writer and web editor for Friends of the National Zoo.*

365 DAYS OF ZOO

Cheetah cubs and fishing cats, a new carousel, and the opening of American Trail are just a few of many reasons to celebrate 2012 at the Smithsonian's National Zoo.

"How do you measure a year?" ask the characters in *Rent*. Here at the Zoo, we measured 2012 in triumphs and tragedies and almost everything in between. Our milestones included animal births and deaths, the opening of new exhibits and facilities, hard-won achievements by our scientists and animal care team, and much more.

The images on these pages offer glimpses into 2012 at both Rock Creek and Front Royal. For every story we had room to highlight, there are countless others. Each is a tale of dedication: to the well-being of the animals in our care, to conservation in the wild, to visitor education and enjoyment, to expanding the frontiers of conservation biology.

As you journey through last year, know that you too were among its actors. Your dedicated support of the Zoo helped make amazing things happen. Thank you.

LISA H. WARE/NZP

MEHGAN MURPHY/NZP

CLYDE E. NISHIMURA

MARK VAN BERGH

JANICE SVEDA

1.5.12 Four maned wolf cubs in Front Royal. The arrival of newborns from this hard-to-breed species brought a new birth of hope for the declining North American population.

2.2.12 Fighting heart disease in gorillas. Zoo veterinary staff implanted a recording device between the shoulder blades of Kojo, a ten-year-old male. It can detect signs of heart disease.

4.23.12 Cheetah cubs in Front Royal. Two newborn cats, one delivered by cesarean section, were raised by hand after their mother rejected them. They are now on exhibit at Rock Creek.

5.12.12 Otters on exhibit. Two Asian small-clawed otters and nine of their offspring are enchanting visitors to Asia Trail.

5.18.12 Fishing cat kittens are a Zoo first. The young cats, one male and one female, are the fruit of determined efforts to breed this endangered species.

365 DAYS OF ZOO

7.6.12 First Cuban crocodile hatchlings since 1988. A male croc emerged from his leathery shell. Another followed on July 14. Both are genetically valuable additions to a critically endangered species.

7.29.12 Flamingo chick. The fluffy white bird has since turned pink, due to pigments in its food. They mimic the feather-coloring shrimp in flamingos' natural diet.

8.9.12 Przewalski's horse born in Front Royal. The female foal boosts the Zoo's herd of these endangered horses, which went extinct in the wild.

9.1.12 American Trail opens. Years of planning and construction yielded a gorgeous new home for seals, sea lions, gray wolves, and more.

9.5.12 Support for giant panda research. Ford Motor Company pledged $400,000 to further the Zoo's studies on the health of these beloved, critically endangered bears.

9.16.12 Giant panda cub: elation to devastation. Zoo director Dennis Kelly, and countless others, marveled at the unexpected birth—then grieved when the newborn died a week later.

BARBARA WATKINS/NZP

JIM JENKINS

DOLORES REED/NZP

MARK VAN BERGH

BRITTANY STEFF/NZP

MEHGAN MURPHY/NZP

Big Appetites

Each year, Zoo animals consume roughly 96,000 pounds of vegetables, 63,000 pounds of seafood, and 48,000 pounds of meat. And that's not counting the three million live crickets and seven million live mealworms. Bon appetit!

365 DAYS OF ZOO

GIL MEYERS/NZP

10.13.12 Dama gazelle calf at Rock Creek. A newborn female and her half-brother, born a month earlier, have drawn attention to the plight of this critically endangered species.

10.18.12 New academic center in Front Royal. Gleaming new facilities house the Smithsonian-Mason School of Conservation in Front Royal.

10.21.12 Tentacled snakes born. Keepers were startled when parents that had never reproduced gave birth to eight young snakes.

10.25.12 Scientific honors. Endocrinologist Janine Brown won the Morris Animal Foundation's Innovation in Veterinary Medicine Award for her work on animal reproduction.

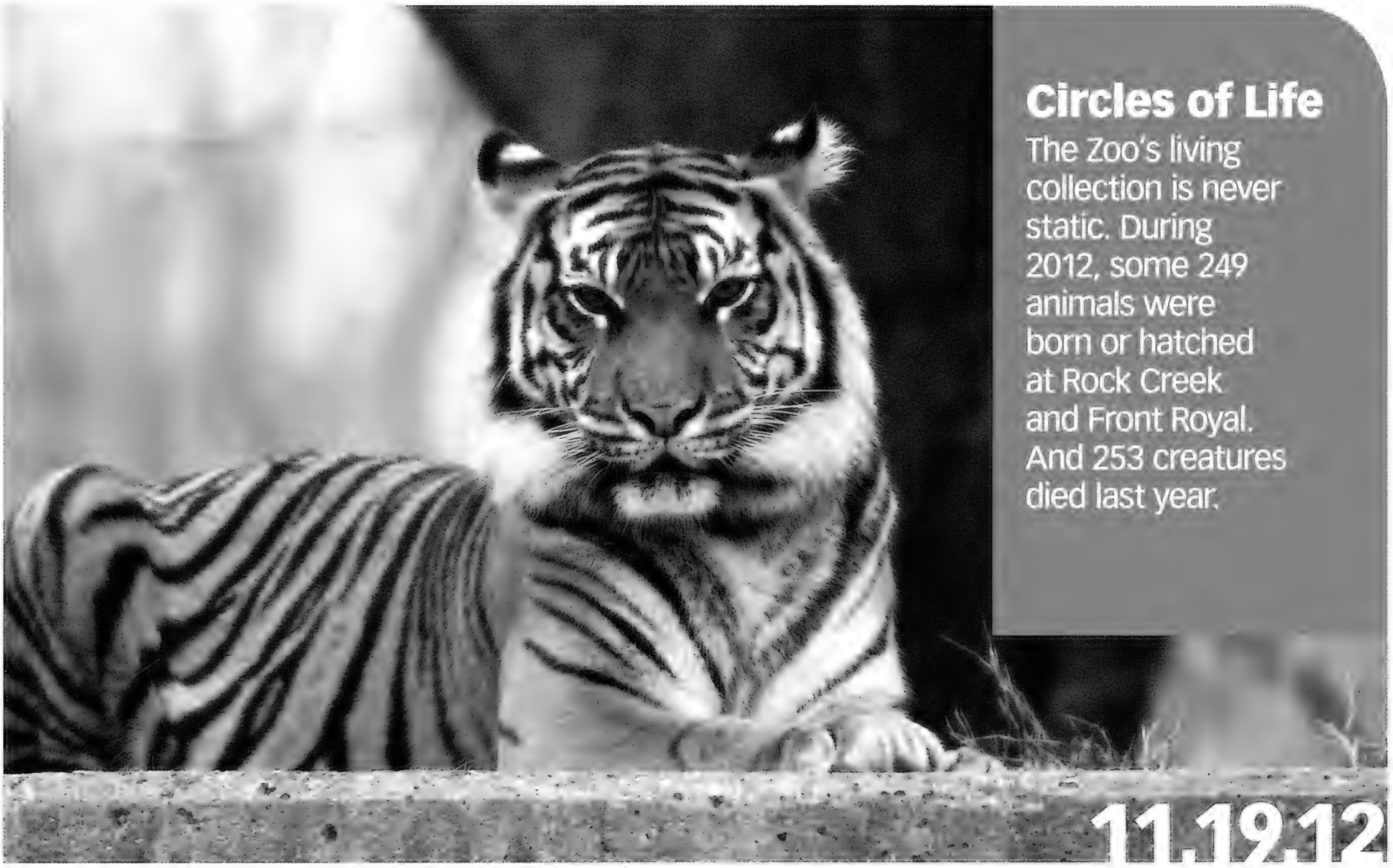
11.19.12 Farewell to an aged tiger. Nineteen-year-old Soyono was euthanized after her health and quality of life had declined.

11.26.12 New carousel opened. The Speedwell Foundation Conservation Carousel features solar panels and hand-carved Zoo animals.

SMITHSONIAN'S NATIONAL ZOO

SMITHSONIAN'S NATIONAL ZOO

JESSIE COHEN/NZP



ANN BATDORF/NZP

Circles of Life

The Zoo's living collection is never static. During 2012, some 249 animals were born or hatched at Rock Creek and Front Royal. And 253 creatures died last year.

11.19.12

MARK VAN BERGH

TWO PARTNERS. ONE MISSION.

As our mission statements (below) attest, the Zoo and FONZ work together toward a single, shared goal: inspiring society to conserve and restore the natural world.

SMITHSONIAN'S NATIONAL ZOO

We provide engaging experiences with animals and create and share knowledge to save wildlife and habitats.

FRIENDS OF THE NATIONAL ZOO

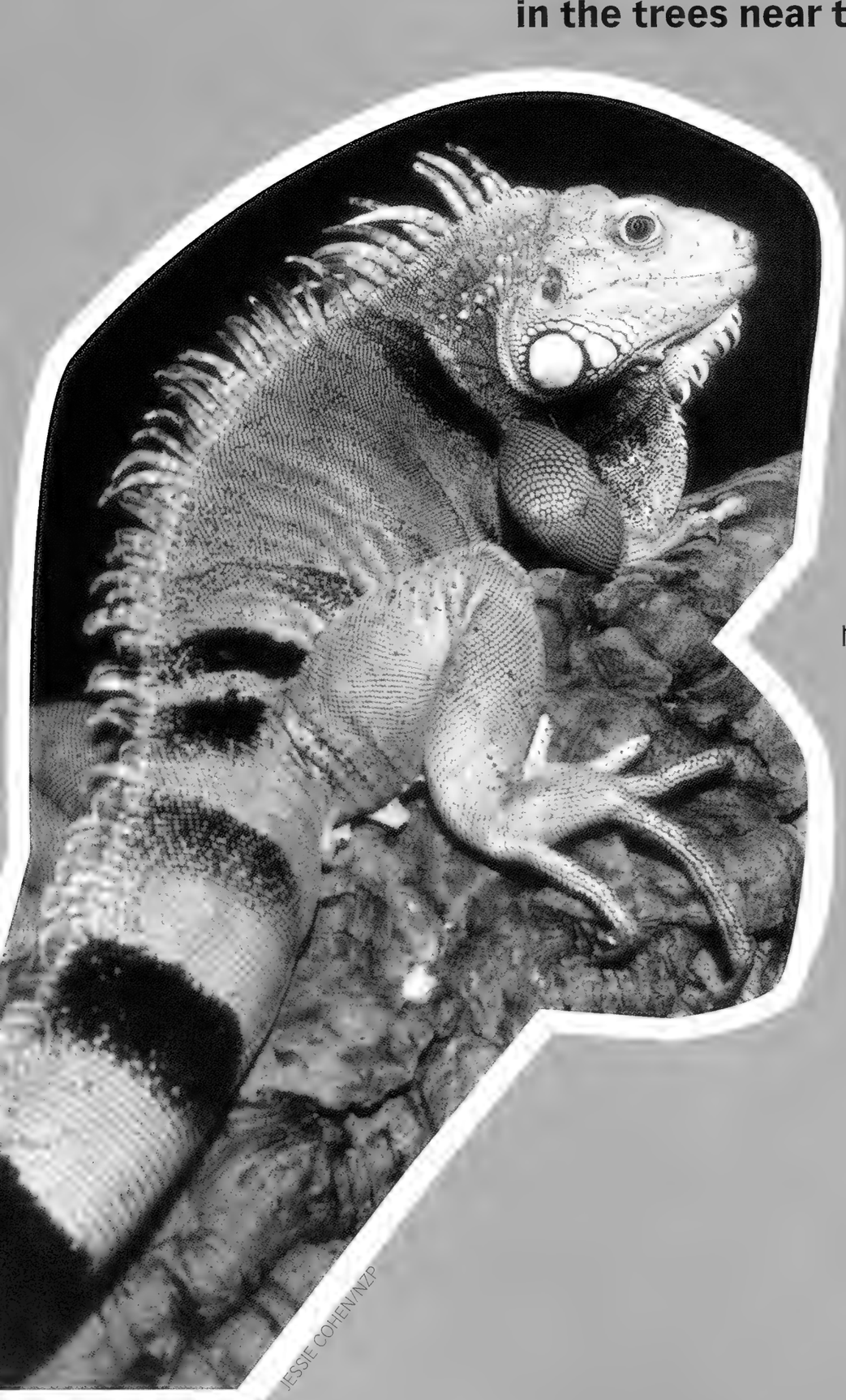
Friends of the National Zoo (FONZ) is the dedicated partner of the Smithsonian's National Zoo. FONZ provides exciting and enriching experiences to connect people with wildlife. Together with the Zoo, FONZ is building a society committed to restoring an endangered natural world.

BEAST BITS

Just Visiting

Some of the most popular birds at the Zoo don't actually live here. They are black-crowned night-herons. Each spring, dozens of these 25-inch-tall birds arrive in the park on their way north from their winter homes. They court, pair up, build nests, and lay pale blue eggs, which hatch about a month later. The Zoo is the only place in Washington where these birds are known to nest. **You can spot black-crowned night-herons from March to September in the trees near the Bird House.**

JESSIE COHEN/NZP



JESSIE COHEN/NZP

Baby Food

Just like us, green iguanas carry bacteria in their bodies. The tiny organisms help the reptiles digest their food, mainly leaves and fruit. Problem is, young iguanas are bacteria-free when they hatch. So the hatchlings find droppings from adults—and eat them. That may not sound tasty, but it fills the reptiles' bellies with the bacteria they need.

99%

of Earth's animals are invertebrates. That means they have no backbones.

fun fact

ZOO CREW

Medical Manager

When an animal catches a cold, needs a vaccine, or is due for a checkup, Jenny Santiestevan gets busy. As manager of the Zoo's animal hospital, she ensures that veterinary technicians and support staff are where they need to be to care for ailing animals.

CRISTINA SANTIESTEVAN

"I love what I do," says Santiestevan. She keeps track of supplies, schedules, and equipment, and she helps everything run smoothly at the Zoo's veterinary hospital.

No Typical Day

Every day at the veterinary hospital begins with rounds. That's a meeting of the whole team. Veterinarians, vet techs, and animal keepers discuss the current patients, any planned procedures for the day, and any animals that may be showing signs of trouble. A single day's agenda may include routine health checkups, vaccinations, x-rays, blood tests, and more. Every day begins with a plan, but the animals often have other ideas.

"There's no such thing as a typical day," says Santiestevan. "Something always comes up." When that something unexpected happens—an animal refuses to eat, for example—Santiestevan looks at the day's schedule and makes a decision about who can best help out. "A lot of what I do is logistical. If something comes up, I try to make sure we can handle that while also providing enough coverage in different areas."

Panda Assist

"I knew I wanted to get into the conservation and science side of veterinary technology work," says Santiestevan. She worked at several veterinary practices and managed an animal diagnostic lab before arriving at the Zoo. "I started emailing and calling people at the Zoo, and then stumbled across a listing for a technician in the reproductive sciences lab. That's how I made it into the Zoo."

Santiestevan still puts her vet tech and reproductive sciences skills to work to assist with medical procedures, including artificial inseminations (AIs). For example, when a team of Zoo scientists and veterinarians recently performed an AI on giant panda Mei Xiang, she was there to lend a hand.

"It's a lot to do," says Santiestevan. "But, it's also really exciting. And, it's great to see how we can pull together for something big like that and make it all work and run smoothly."

A Word of Advice

The Zoo's veterinary team—veterinarians, vet techs, pathologists, and other specialists—includes about 25 people. "Zoo veterinary science is a competitive area," says Santiestevan. Her advice for would-be zoo vets or vet techs is simple: volunteer. "It's a great way to get your foot in the door. It's a great way to learn about any zoo job, really. Just volunteer and get in there."

Every spring, the Zoo seeks teen volunteers to serve as class aides for our Summer Safari program. You can learn more about it and find other organizations that need teen volunteers at ***nationalzoo.si.edu/Support/Volunteer/Teens/.***

CREATURE FEATURE

Cool Cats IN HOT SPOTS

Tiny but tough, sand cats are the only felids that dwell primarily in deserts. Learn how they survive in the scorching sands.

BY PETER WINKLER

NO PLACE FOR Picky Eaters

Desert dwellers don't get much of a menu. So sand cats have adapted to eat just about any of their neighbors. Small rodents are the cats' primary prey, but these heat-loving hunters also dine on reptiles (even venomous snakes) and birds. The cats sometimes bury their prey and return to it later for seconds.

Ears WITH AN EDGE

Supersharp ears are among sand cats' most important hunting tools. Large, triangular external ears and bigger-than-usual ear canals help these predators detect prey—even if it's underground.

DESERT Drinks

By definition, deserts are dry places, getting less than ten inches of rain a year. That makes finding water a challenge. Fortunately, sand cats can go months without even a sip of water. Instead, they get moisture from their prey. When they do find water, though, the cats drink it eagerly.

At the ZOO

Prowl on over to the Small Mammal House to meet Thor, the first sand cat ever on exhibit at the Smithsonian's National Zoo.

ROUGH Neighborhood

Just like a house cat, right? Wrong. Sand cats may look soft and sweet, but they're rugged survivors. They live in some of the toughest places on Earth: sandy and stony deserts of the Eastern Hemisphere, from North Africa all the way east to Asia.

Designed FOR THE DESERT

Sand cats have evolved to cope with soaring temperatures. Fur between their toes and at the bottom of their feet allows these hunters to move across blistering sand in pursuit of prey. Long hair in the cats' ears keeps sand out of those important organs. The cats' digging skills help them hide underground during the day.

CONNOR MALLON/NZP

YOUR TURN

Mixed-up Meals

Below are five creatures that sand cats hunt and eat. Can you unscramble the letters to learn what they are?

INSKK

BGIERL

ECPA ERHA

PVIRE

LKRA

ANSWERS: skink, gerbil, Cape hare, viper, lark

FONZ

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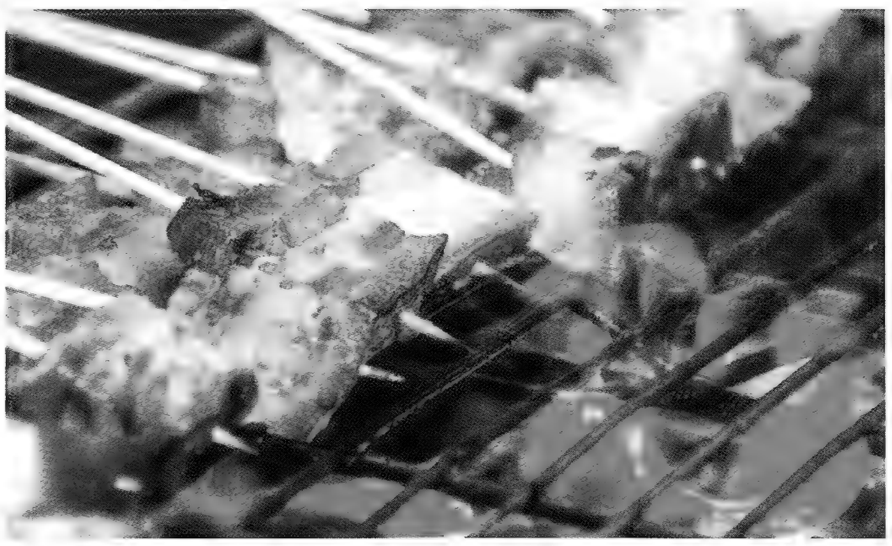

JAMES JENKINS (ALL)

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office party

office party at the Zoo

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This listing reflects contributions from January 1 to December 31, 2012.

ANDREW KING

Look at Me!

This peacock's proud display was literally for the birds, but none of the females around him showed any interest in his flashy feathers. So FONZ member Andrew King decided he'd give the poor guy an audience.

"I was able to sit on the bench right in front of him," King says. "I crouched down and tested the limit of how close I could get to take a photo. He would alert me with a sound if I was too near. It was one of my best photos of the day."

Technical Notes —
CAMERA: Panasonic DMC-FZ40; EXPOSURE: 1/160 sec at f/3.6; ISO: 250

Smithsonian Zoogoer

welcomes FONZ members' submissions of photos taken at the Zoo. Please send photos to **Zoogoer@si.edu**. We will contact you if we are able to use your picture for the Zoo View page.

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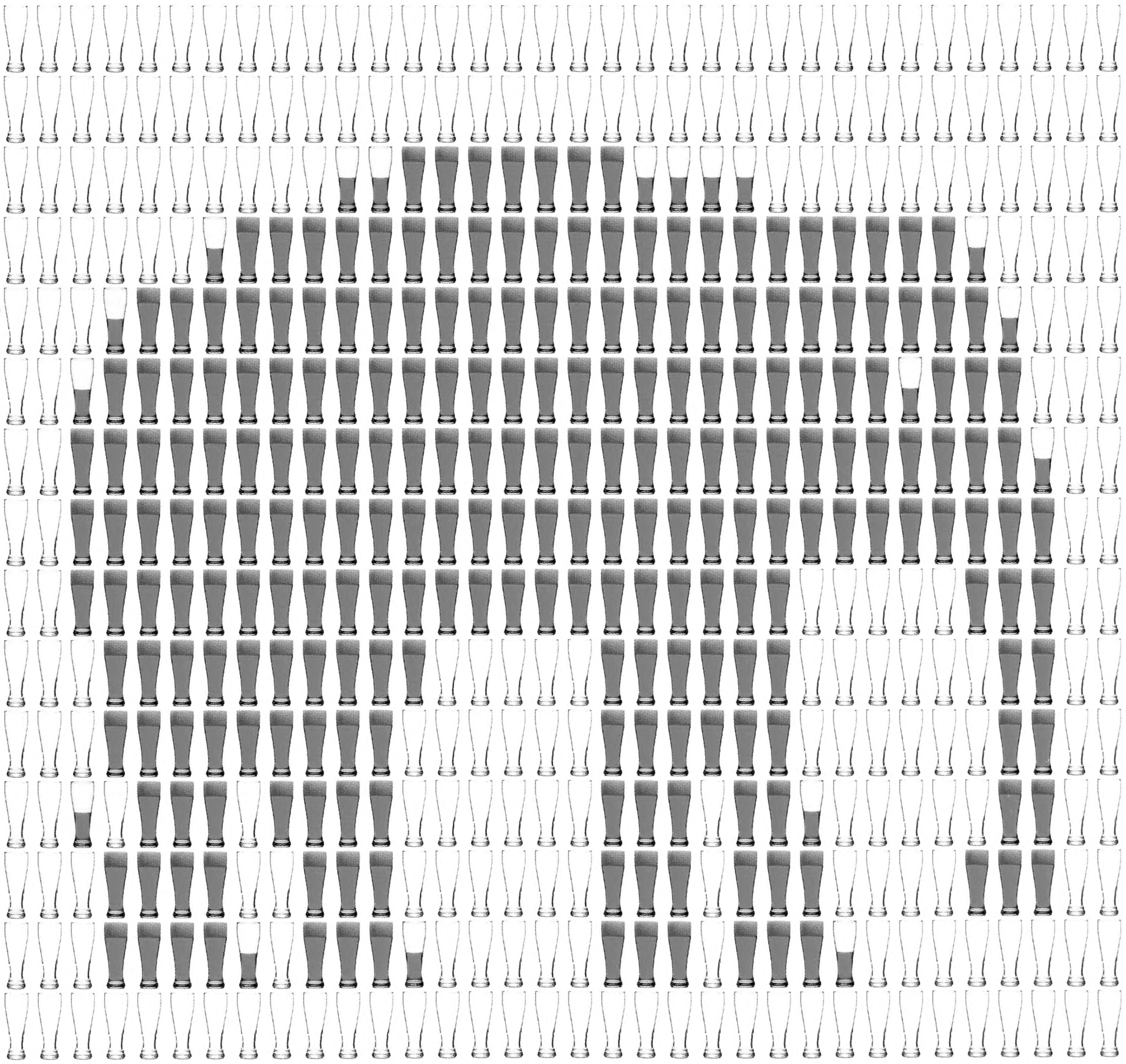
Membership in the FONZ Photo Club is open to photographers of all skill levels. The group meets monthly to hear guest speakers and to share and discuss members' work. Learn more at ***fonz.org/photoclub.htm.***



Changing the world, one beer at a time.

Join us July 11 for Brew at the Zoo and raise a glass for a good cause! Enjoy samples from 60 craft breweries while rocking to live music, all in the exotic setting of the National Zoo. Tickets go on sale June 3, at fonz.org/brew.htm. Proceeds support the Zoo's conservation programs. Get your tickets early and head to the National Zoo, where enjoying great beer helps save wildlife. *This is a 21+ rain or shine event. Generously sponsored by Macy's, HOT 99.5 FM, and The Washington City Paper.*

BREW·AT·THE·ZOO

JULY 11, 6-9 P.M.

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